Hoback Elk Herd Unit (E104)
Final Draft Brucellosis Management Action Plan
Wyoming Game & Fish Department
20 February 2007

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A. Introduction

The Hoback Elk Herd Unit (EHU) covers the upper Hoback River water shed. The area is bound on the south by the Hoback Rim, and the east boundary is the hydrographic divide between the Hoback and Green River drainages. The northern boundary is the hydrographic divide between the Gros Ventre and Hoback River drainages. The western boundary is comprised of Dell Creek, Cliff Creek, and the hydrographic divide between the Greys and Hoback River drainages (Figure 1). The Hoback EHU encompasses 296 mi^2 (189,405 acres), lying almost entirely in Sublette County (95.8%). The remainder is in Lincoln (3.6%) and Teton Counties (0.6%). Only 9.5% of the land in this EHU is in private ownership. Most of the land is managed by the United States Forest Service (USFS, 89.5%); the remaining 1% is managed by the Bureau of Land Management (BLM). The major land uses in the area are domestic livestock grazing and year-round recreation. Summer uses include fishing, camping, horseback riding and motorized all-terrain vehicle use. In the fall, hunting is the predominant use. During winter, both private and outfitted snowmachine use is common.

Approximately 272 mi^2 are considered spring, summer, and fall range for elk (Figure 2). There are 19 mi^2 designated crucial winter yearlong range, and 5 mi^2 are considered winter yearlong range. Only about 6 mi^2 are considered elk parturition range.

There are two feedgrounds in the Hoback EHU, and two elk Hunt Areas (HA, Figure 2). Dell Creek feedground (HA 87) is located at the mouth of Riling draw, north of Dell Creek, east of the Hoback River; the feedground is on US Forest Service (USFS) land. McNeel feedground (HA 86) is located about three miles south of US Highway 191 on the east side of the Hoback River. McNeel feedground is on private land, which the Wyoming Game and Fish Department (WGFD) leases. Both Dell Creek and McNeel feedgrounds are intended to prevent damage, co-mingling, and winter starvation of elk. McNeel feedground additionally serves to keep elk away from US Highway 191, and prevents an excessive number of elk from otherwise attending the Franz feedground (Piney EHU- E106).

This Brucellosis Management Action Plan (BMAP) was prepared to develop strategies for dealing with brucellosis issues in the Hoback EHU. Appendix 1 includes data and background information relevant to understanding, formulating, and implementing the plan.

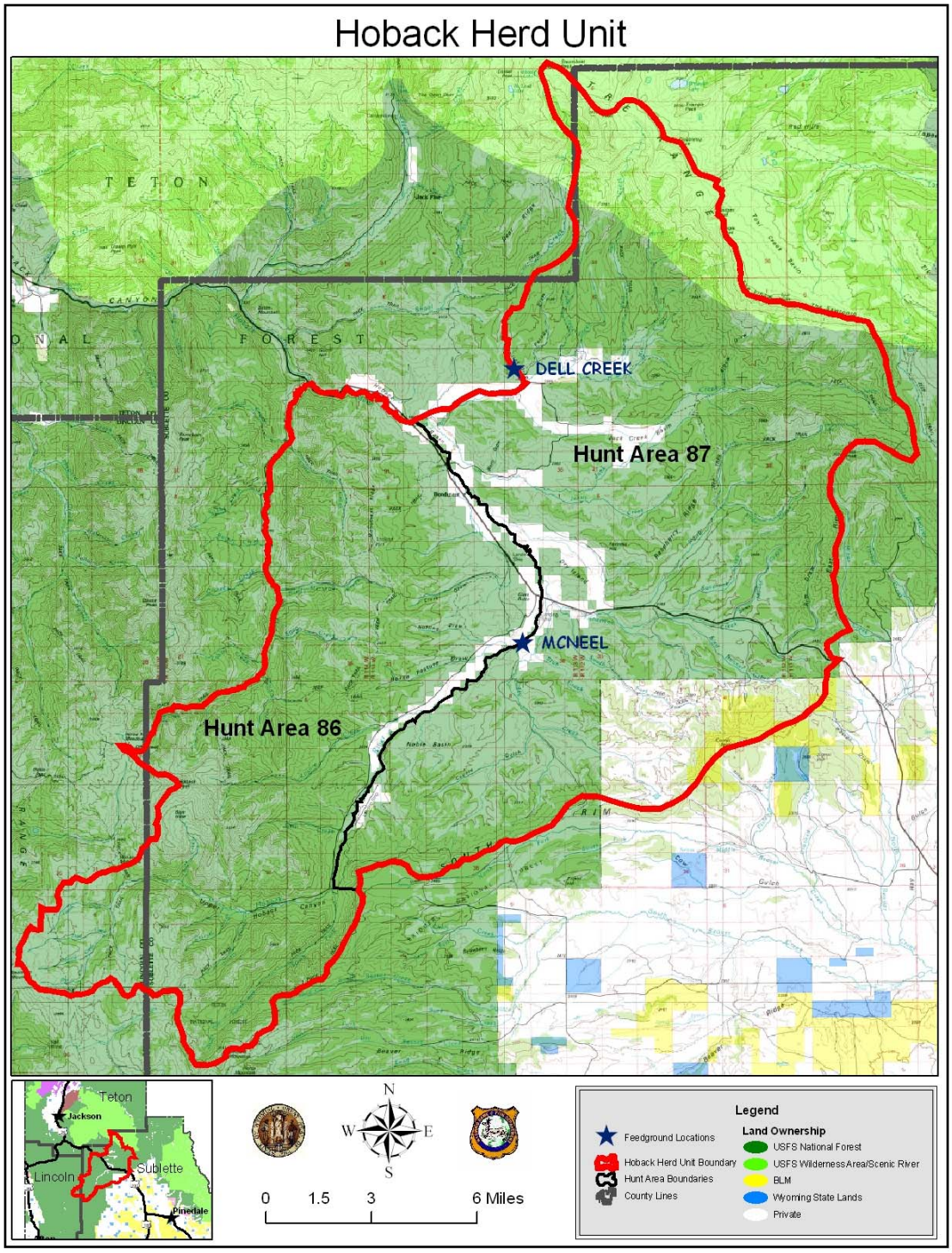

Figure 1. Land ownership, feedground locations, and Hunt Areas within the Hoback EHU.

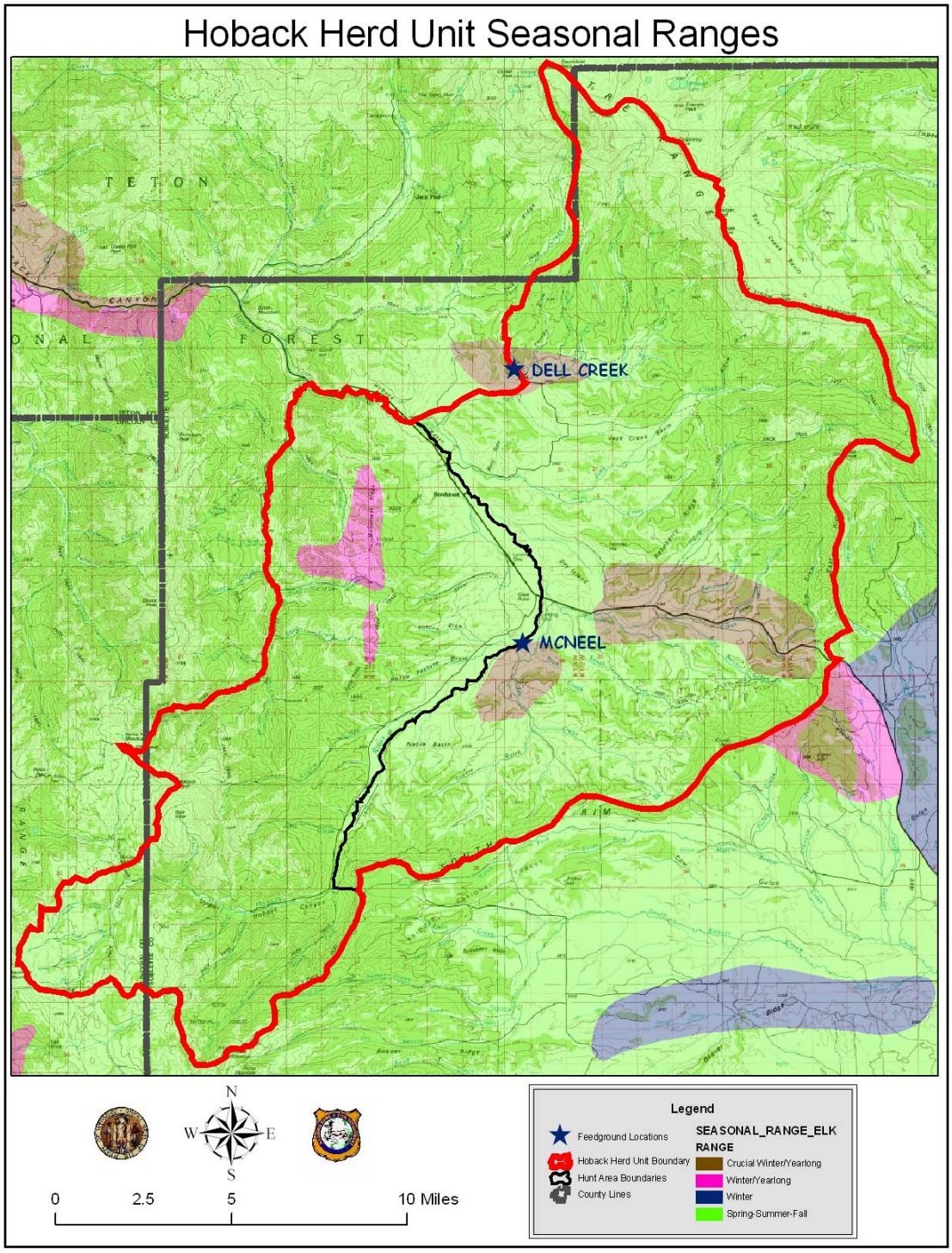

Figure 2. Seasonal elk ranges, elk feedgrounds, and Hunt Areas within the Hoback EHU.

B. Brucellosis Management Options

The Wyoming Game & Fish Department (WGFD) currently employs several methods to minimize intraspecific transmission of brucellosis among elk. Elk feeders are encouraged to feed hay on clean snow when possible to reduce inadvertent ingestion of feed and exudates contaminated with *Brucella abortus*. Elk are ballistically vaccinated with Strain 19 on 21 of 22 state feedgrounds, and currently on the National Elk Refuge (NER) to reduce abortion events. Elk at Dell Creek feedground, in this EHU, have never been vaccinated (*Also see* Appendix 1, section D). Attempts have been made to reduce the duration of the feeding season on each feedground. However, damage and elk/livestock co-mingling concerns typically determine the duration of feeding on many feedgrounds.

Damage and livestock-elk co-mingling concerns contribute to increased risk of intraspecific disease transmission among elk. In most circumstances, elk are not tolerated consuming private crops and co-mingling with livestock. Strategies to hold elk on artificial feed longer and hazing elk to feedgrounds are often employed to minimize these conflicts. These practices increase the chances that an aborted fetus contaminated with *Brucella* will be contacted by elk wintering on feedgrounds, thus increasing intraspecific exposure rates among elk.

Feedground management should continue to include the aforementioned methods currently utilized to minimize disease transmission. However, given current seroprevalence rates for elk feedgrounds and the recent brucellosis occurrences in cattle, these methods alone are not sufficient to reduce incidence of the disease in elk to acceptable levels and prevent future interspecific transmissions. Alternative management options should be evaluated.

The intent of this document is to 1) summarize existing data associated with elk and brucellosis management in the Hoback EHU, 2) incorporate feedback from land management agencies and livestock producers, 3) develop a list of management actions that could reduce brucellosis prevalence in elk and the risk of interspecific transmission from elk to cattle, and 4) indicate how each management option will be applied in the Hoback EHU. This plan is adaptive, and annual revisions will occur to address new disease management tools or technologies and to update information.

To reduce prevalence of brucellosis in elk on feedgrounds, given current technologies and efficacy of vaccines, feeding durations would have to be decreased or ceased, if possible, during periods of high transmission risk. Reduced feeding durations would increase co-mingling if implemented abruptly, but substantial reductions in elk numbers through hunting prior to initiating the option could reduce these situations. Each feedground is unique and was established to address a site-specific management problem. Thus, each feedground will potentially require a different approach if reducing the duration of feeding and/or eliminating feeding are to be pursued as viable options. Some feedgrounds may have no alternative options to supplemental feeding and/or no option to reduce the feeding duration given current herd objectives and other conditions. To reduce the risk of interspecific transmission, cattle and elk need to be separated both temporally and spatially during the risk period. Livestock producers may have the potential to alter management to maintain this separation. As with feedgrounds, each producer and their operation are unique and what may work on one ranch may not work on another.

Listed below are potential options for managing brucellosis on the two feedgrounds in the Hoback EHU. A discussion of each follows, respectively. Short-term objectives of these options are to prevent co-mingling of elk and cattle and to reduce the prevalence of brucellosis in elk. Long-term objectives include eliminating the reservoir of brucellosis in wildlife in the Greater Yellowstone Area (GYA) if determined to be technically feasible, maintain livestock producer viability, reduce/eliminate dependence of elk on supplemental feed, maintain established elk herd unit objectives, improve range health, and maximize benefits to all wildlife. The Wyoming Game and Fish Commission (WGFC) will require support from various constituencies (agriculture, land management agencies, sportspersons, etc.) prior to pursuing the following options, and several options will require decisions from entities other than the WGFC.

1. Relocating feedgrounds to sites with increased geographic area for elk to disperse and increased distance from winter cattle operations.
2. Elimination of feedgrounds.
3. Reducing numbers of elk on feedgrounds through increased harvest.
4. Reducing numbers of susceptible cattle and stored crops in areas where co-mingling/damage are likely to occur during winter, or implementing changes in cattle operations by providing incentives to producers.
5. Elk-proof fencing of feedgrounds or private lands to prevent elk from drifting onto private land and reduce co-mingling.
6. Extensive habitat enhancement projects in suitable winter range areas that will reduce co-mingling/damage and/or will reduce elk dependence on feedgrounds.
7. Acquisition of native winter range through fee-title purchase, conservation easements, or other methods.
8. Strain 19 elk vaccination.

C. Discussion of Options

1. Feedground Relocation

Feedground relocation options are limited in the Hoback EHU. All risks of co-mingling occur during the winter and spring months. Changing feedground locations would most likely disrupt established elk migration patterns. Habituating elk to new locations may require considerable effort.

Land ownership of feedground sites in the Hoback EHU is USFS (Dell Creek) or private (Gil Ordway's River Bend Ranch- Bill and Tony Saunders, managers- under a 25-year lease). Nearby USFS lands do not provide sites with suitable space, slope, and other attributes that would make feedground relocation desirable. Relocating feedgrounds to other private lands would also be unlikely. Many of the private landowners have cattle wintering on their private lands. Relocating feedgrounds to other private lands would put elk and cattle in closer proximity to each other, increasing the risk of co-mingling. During the process of obtaining the McNeel feedground lease in 2006, WGFD found no suitable alternative locations for either McNeel or Dell Creek.

Decision authority would lie with the WGFC if options were available. If more optimal locations for these feedgrounds existed, relocation should be considered.

Pros:

- may contribute to lower brucellosis prevalence
- elk would have increased area to disperse
- elk could be fed on larger areas and in more sanitary conditions
- elk numbers could be maintained at or near current levels

Cons:

- brucellosis prevalence may persist
- would require funds for erection of new structures, fences, roads, etc.
- potential difficulty habituating elk to the new site
- localized damage to vegetation
- might increase competition of elk with other species

2. Feedground Elimination

This option, given current conditions and herd objectives, is probably unfeasible for feedgrounds in the Hoback EHU. Over the last twenty years, over 90% of the elk in the Hoback EHU have spent the winter on feedgrounds (*Also see* Appendix 1, section B). However, if current conditions and herd objectives change, through implementation of one or more of options 3,4,6,7, and 8, this option might become more realistic. The WGFC has the authority to make this decision.

Pros:

- would reduce the risk of intraspecific transmission of brucellosis and other density-dependent diseases
- would facilitate efforts to eliminate brucellosis in elk in the Hoback EHU
- would reduce feedground and vaccination expenses incurred by WGFD

Cons:

- would increase the risk of property damage and interspecific transmission of brucellosis to livestock if implemented with current numbers of elk and /or prior to elimination of brucellosis in elk
- increased risk of property damage would entail increased fiscal and personnel resources from WGFD
- would increase elk winter mortality
- would lower the number of elk that could be wintered in the Hoback EHU
- would reduce long-term income to the WGFD due to reduced license sales
- would reduce hunter opportunity
- may increase potential for vehicle-elk collisions
- would eliminate the means for elk vaccination and test & removal program (offset by natural reduction in intraspecific brucellosis transmission)

3. Elk Reduction

Reducing elk numbers on the feedgrounds in the Hoback EHU through liberalized hunting seasons could allow more flexibility to pursue options 2 and 6, and could lead to more favorable conditions for options 7 and 8. The WGFC has the authority to make this decision.

Pros:

- might contribute to lower brucellosis prevalence
- would increase hunting opportunities in the short term
- would increase license revenues in the short term
- would decrease elk densities on feedgrounds
- potentially reduce conflicts on private lands
- would reduce costs of supplemental feeding and vaccination

Cons:

- the response of seroprevalence of brucellosis in elk when populations are reduced is unknown, yet it is unlikely to reduce incidence to an acceptable level assuming that the remaining elk continue to attend feedgrounds
- damage to private crops might continue
- the general public may be unwilling to accept large reductions in elk numbers
- success might be limited to hunter efficiency
- would result in loss of some hunting opportunity in the long term
- will reduce license revenue in the long term (might be offset by reduced management costs)

4. Cattle Producer Change of Operation

This is an option that high-risk and other producers in the Hoback EHU could implement to minimize/eliminate brucellosis risks to their herd. Brucellosis transmission potential within cattle and testing requirements associated with cow/calf operations would be eliminated if all cattle operations were yearlings, spayed heifers, and/or steers. Conversion to yearlings would also eliminate the need of storing most hay crops and winter feeding, reducing winter elk conflicts. Operations that feed through the winter can take small measures to avoid attracting elk such as feeding in the morning and feeding every day to keep feeding areas clean of hay. Ultimately, opportunity for disease transmission is reduced if cattle and elk do not co-mingle between early February and mid June (Thorne et al. 1991, Roffe et al. 2004). Implementing facets of this option would require changes by the producer and possibly a favorable decision by the USFS to alter grazing permits.

Evaluation and implementation of alternatives in this option are totally under the jurisdiction of individual livestock operators, Wyoming Livestock Board, State Veterinarian, and the Animal and Plant Health Inspection Service (APHIS). Discussion and recommendations pertaining to this option should be contained in Individual Ranch Herd Plans for each livestock operation.

5. Fencing

Fencing of winter cattle feedlines could prevent elk from co-mingling with cattle. Elk-proof fencing around private stackyards can help in reducing an operation's attractiveness to elk. New fencing would require favorable decisions by the landowner. Where fencing stackyards is considered beneficial, WGFD provides fencing materials to landowners.

Elk-proof fencing around elk feedgrounds can contain most elk within a given area. Fencing projects around the feedgrounds would require favorable decisions by the landowner (state and/or federal).

Pros:

- may reduce damage problems and complaints
- may reduce risk of elk-cattle brucellosis transmission
- may be successful in fencing off stored hay and small-scale issues
- reducing the attractiveness of particular operations to elk may lead to overall reductions in damage in the general area

Cons:

- costs may be prohibitive- for construction, maintenance and monitoring
- congregating all or most of the elk within the fence may be unfeasible
- long lengths of fencing could impede movements of other wildlife
- does not address seroprevalence of brucellosis in elk
- some producers may be unwilling to erect fences
- may require federal agency cooperation and potential National Environmental Policy Act (NEPA) compliance
- impedes Forest access
- reduces wildlife viewing opportunities

6. Habitat Enhancement

Historically, few elk wintered within the Hoback EHU due to deep snow conditions. Little opportunity exists for developing significant acreages of winter range today. However, there could be potential for enhancement of spring and fall range. Habitat enhancement projects may reduce the time elk spend on feedgrounds. If habitat improvements are completed near feedgrounds or between summer range and feedgrounds, the enhanced forage produced will decrease the dependence of elk on artificial feed, snow conditions permitting. Reduced feeding durations and lower elk concentrations on feedgrounds, especially during the high transmission risk period, may decrease the probability of intraspecific brucellosis transmission events. Habitat enhancement projects also create vegetative diversity, enhance aspen communities, and improve range conditions for other species.

Decision authority is with the USFS for most areas. Consultation and cooperation with the affected grazing permittee would also be necessary. Habitat enhancements might be best used in conjunction with options 2,3, and 8 to achieve maximum success.

Pros:

- could reduce feeding duration and brucellosis prevalence
- would benefit many species of wildlife and, in some instances, cattle
- funding is available through government and non-government agencies

Cons:

- may have limited effectiveness in reducing dependency on supplemental feed in years of average or greater snow accumulations that make forage unavailable
- elk may not be tolerated on treatment areas when in close proximity to livestock

- requires changes in post-treatment wildlife and livestock management within the treatment area to ensure treatment effectiveness
- may increase likelihood of invasive species establishment

7. Acquisition/Conservation Easements

Disease transmission risk on feedgrounds in the Hoback EHU might be decreased by managing lands adjacent to, or connected with, areas used by wintering elk. With adequate intact, healthy, and accessible elk winter habitat available, elk feeding may be reduced in this EHU. This option also secures habitat for other wildlife species. The buying or long-term leasing of land to be managed commensurate with wildlife benefits is an option that can be used to maintain stability and health of all wildlife populations. Decision authority is with the private landowner.

Pros:

- secures habitat for all wildlife
- long-term solution
- helps secure future revenues for the WGFD
- may facilitate options 2 and 7
- could reduce brucellosis prevalence in elk
- agreeable among landowners and agencies

Cons:

- expensive
- limited availability of lands with high potential for wintering elk or connecting to existing or potential elk winter ranges
- requires landowner willingness

8. Continuation of Strain 19 Elk Vaccination Program

The WGFD initiated this program in 1985 on Greys River feedground, and has vaccinated approximately 66,000 elk to date on 21 state-operated feedgrounds and the NER. Elk cows and calves are vaccinated the first two years, then calves only thereafter assuming adequate coverage is maintained. Dell Creek feedground serves as a control population (i.e., no vaccination) to assess effectiveness of the vaccination program in reducing brucellosis seroprevalence in elk (*Also see* Appendix 1, section D).

Controlled studies with captive elk indicated Strain 19 elk vaccinates were around 30% less likely to abort than unvaccinated control animals after being challenged with *B. abortus* strain 2308 (69% abortion rate in non-vaccinated elk and 40% in vaccinates) (Thorne et al., 1981). However, brucellosis seroprevalence data from Dell Creek and Greys River feedground elk indicate no significant difference. Protection from *Brucella* induced abortions afforded by Strain 19 vaccination may not be sufficient to effectively reduce seroprevalence in elk on feedgrounds. This may be due to the potential for numerous elk to come into contact with a single infected fetus aborted on a feedground, and the potential that the infectious dose may overwhelm antibody protection. Decision authority lies with the WGFC.

Pros:

- may be reducing total number of *Brucella* induced and infected elk fetuses aborted on feedgrounds
- perceived by many to be an active disease management tool
- the logistics/tool of delivery has already been developed, just waiting for improvement in the vaccine itself

Cons:

- will be very expensive and require substantial fiscal and personnel resources
- has not shown to reduce seroprevalence in elk on feedgrounds
- elk must be concentrated on feedgrounds to ensure delivery is feasible

D. Coordination Meetings

Intra-agency coordination meeting

On 25 October 2006, a WGFD intra-agency meeting was held at the Pinedale Library to provide an overview of the current Hoback EHU BMAP draft and discuss alternative management options to elk feedgrounds and brucellosis management. Each option was discussed individually.

Interagency coordination meeting

On 27 October 2006, an inter-agency meeting was held at the Pinedale Library to provide an overview of the current Hoback and Piney BMAP drafts and discuss alternative management options to elk feedgrounds and brucellosis management. Agencies attending were WGFD, BLM, NRCS, and APHIS. Each option was discussed individually, with most time spent on options 4 (Incentives for Producer Change of Operation), 5 (Fencing), 6 (Habitat Enhancement), and 7 (Acquisition/Conservation Easements). NRCS personnel were supportive of and willing to participate in option 4 and could possibly assist with labor costs associated with option 5 (on private lands). All agencies agreed that opportunities for option 6 should be pursued when feasible, but that securing a forage reserve to assist implementation of this option would be facilitated most by working with local land-trust agencies to implement option 7 (specifically through conservation easements).

Aside from the interagency meeting on October 27, several communications have taken place between WGFD and BTNF personnel. Personnel with the BTNF have indicated continued willingness to pursue habitat treatments that would reduce elk dependency on supplemental feed and increase use of native range. These discussions are ongoing. BTNF and WGFD personnel work together regularly to coordinate habitat enhancement and monitoring projects.

Producer meetings

Each livestock producer in the Hoback EHU was contacted by WGFD personnel in July-November of 2006 to be informed of the drafting of this BMAP. Fifteen different producers and/or grazing permittees were contacted. There are ten livestock operators who own land within the area comprising the Hoback EHU; six of these land-owning

operators also hold grazing permits on the surrounding BTNF. There are an additional four operators who simply hold grazing permits. Several of these producers were invited to visit with WGFD personnel, on a one-on-one basis, to discuss brucellosis issues and the options contained in this BMAP.

In addition to meetings with individual producers, WGFD held two meetings designed to bring producers together as a group. On 5 December 2006, a livestock producer meeting was held at the Bondurant Elementary School to provide an overview of brucellosis ecology/etiology, a summary of the current draft Hoback EHU BMAP, and discuss alternative management options to elk feedgrounds and brucellosis management in the Hoback EHU. WGFD personnel along with 3 livestock producers were in attendance. All options were discussed individually, and no significant recommendations were made.

On 19 December 2006, a second livestock producer meeting was held at the Bondurant Elementary School to provide a summary and hard copy of the current draft BMAP, discuss alternative management options to elk feedgrounds and brucellosis management, and discuss WGFD proposed management actions with respect to individual options in the Hoback EHU. WGFD personnel along with 3 livestock producers (non-overlapping with the first producer meeting) were in attendance. All options were discussed individually, and no significant recommendations were made.

E. Producer Survey Questionnaire

A standardized questionnaire was presented to each producer in the Hoback EHU in order to quantitatively assemble their opinions. The goals of the questionnaire were to collect quantifiable data regarding 1) the opinions of livestock producers regarding the 8 options currently listed in the BMAP, and 2) risk of damage from and/or co-mingling with elk. WGFD personnel met with several producers on a one-on-one basis. During these meetings, the producer was asked to complete the questionnaire. Producers not met with individually were given the opportunity to complete the questionnaire when attending either of the producer meetings. Because some of the producers and permittees in the Hoback EHU are also in the Piney EHU (the Piney BMAP was being written concurrently with this one) we did not ask them to complete a second, separate survey for the Hoback EHU. Five producers returned questionnaires.

The first objective of the questionnaire was to quantify the percentage of livestock producers within the Hoback EHU comprising defined opinions (Strongly Opposed, Moderately Opposed, Indifferent, Moderately Support, Strongly Support) regarding individual BMAP management options. The percentages of the various opinions and results of livestock producer operations were compared to qualitative data (i.e., written responses to management options from questionnaire; verbal responses from meetings) when determining the feasibility of implementing various options.

The second objective was to quantify various aspects of livestock operations in the Hoback EHU, particularly those that are related directly (Damage, Y/N) and indirectly [Hay Production (Y/N), Amount of Hay Produced (acres), Stackyards Present (Y/N), Total Stackyards, Winter Feeding (Y/N), Distance to Nearest and Next Nearest Feedgrounds] to damage from, and potentially co-mingling with, elk. Five producers

responded to the survey, however, only three different ranches were represented. With data from only three ranches, it is unrealistic to draw useful generalizations on the relationship between damage, operation type, winter feeding, etc. Therefore, data collected as part of objective 2 were not analyzed or included in this BMAP.

2. Quantitative Responses to Questionnaire

Of the fifteen producers identified in the Hoback EHU, five responded to and provided opinions to the options within the questionnaire. Quantitatively, responses regarding individual options are variable, but some trends are apparent (Table 1).

Table 1. Percentages of responses (Opinions) regarding individual BMAP Options in the Hoback EHU. Based on five respondents.

	Opinion				
Option	Strong Opp.	Mod Opp.	Indifferent	Mod Sup.	Strong Sup.
1	100	-	-	-	-
2	100	-	-	-	-
3	60	20	-	20	-
4	20	-	-	40	40
5	-	20	10	50	20
6	80	20	-	-	-
7	40	-	20	40	-
8	-	-	-	-	100

The majority of producers are very supportive of (option 8) continuing the Strain 19 vaccination program. This was the only option that every producer showed support for. The other option that producers appear at least moderately supportive of was providing incentives to livestock producers for change of operations (option 4). Producers were unanimous in opposition to relocating feedgrounds (option 1); eliminating feedgrounds (option 2); and implementing habitat enhancement projects (option 6). Another option that producers appear at least moderately opposed to is reducing current elk herd numbers (option 3). Opinions regarding fencing stackyards, feedgrounds or other areas (option 5); and acquisition of native winter range (option 7) were mixed and/or indifferent.

3. Qualitative Responses to Questionnaire

Individual qualitative responses (edited for grammar and punctuation) to the questionnaire are listed below.

Option 1. Relocating feedgrounds to sites with increased geographic area for elk to disperse and increased distance from winter cattle operations.

1. If it's not broke, don't fix it! WGFD has a good relationship with [our ranch]. Gil Ordway giving the WGFD a 25-year lease is a good sign that the landowner thinks that [the McNeel feedground] is a good thing.

2. A lot of thought and research went into the decision to locate the existing feedground (McNeel) in this present location years ago. It has worked exceedingly well all this time. A 25-year lease was given last year by Gil Ordway for the preservation of this unit. Hopefully it will continue indefinitely.

Option 2. Elimination of feedgrounds.

1. Feedgrounds were built for a reason, and the reason still exists, so we better keep them around.
2. The only way the elk can be vaccinated for any disease is by doing the job on the feedground. Elk travel in herds- basically no difference where there is feed they will be bunched- native grass or hay. People with years of experience watching non-fed elk should be listened to.

Option 3. Reducing numbers of elk on feedgrounds through increased harvest.

1. This decision should be left up to the WGFD. WGFD has all the correct information on numbers.

Option 4. Reducing numbers of susceptible cattle and stored crops in areas where co-mingling/damage are likely to occur during winter, or implementing changes in cattle operations by providing incentives to producers.

1. Depends on the situation.
2. Provide a guaranteed vaccine for brucellosis to ranchers and make sure it is used by vet certificates. Test horses free of charge, and perhaps cattle.
3. Would support help in situations where there is critical co-mingling. Believe that it could be taken advantage of by some operators, but in a legitimate situation, I would strongly support.
4. With guidelines such as fencing compensation, water development, and other management that would keep elk and cattle separate.

Option 5. Elk-proof fencing of feedgrounds or private lands to prevent elk from drifting onto private land and reduce co-mingling.

1. Keep it in perspective! Support stackyards mostly.
2. Be very selective because of viewing a primitive area.

Option 6. Extensive habitat enhancement projects in suitable winter range areas that will reduce co-mingling/damage and/or will reduce elk dependence on feedgrounds.

1. I'm sure there is always room for improvement, but as far as the Hoback Basin goes, once it snows, everything is covered anyway. The Basin is more summer range than winter range.
2. Not feasible in this area.

Option 7. Acquisition of native winter range through fee-title purchase, conservation easements, or other methods.

1. "?"
2. "?"

3. Strongly feel that conservation easements should not be government funded. Would support purchase of ground by WGFD for feedgrounds, but not native winter range- because there isn't any.

Option 8. Strain 19 elk vaccination.

1. Absolutely.

F. Proposed Management Actions

1. Feedground Relocation

The WGFD will not pursue this option in the immediate future. Relocation options for both feedgrounds in the Hoback EHU are not only limited, it appears that the feedgrounds are in as optimal locations as they can be for the purposes they serve.

2. Feedground Elimination

The WGFD will not pursue this option in the immediate future given existing elk brucellosis seroprevalence rates, risk of damage/co-mingling, and public expectations for current elk numbers.

3. Elk Reduction

WGFD manages for current, Commission-established, elk herd unit population objectives. Elk herd unit reviews occur every 5 years. Elk herd unit management, including population objectives for the Hoback EHU were reviewed and discussed in public meetings during the spring of 2006. Following meetings, public input, and recommendations from Jackson/Pinedale WGFD personnel, the WGFC elected to nominally increase the Hoback EHU objective from 1,079 to 1,100 elk. The WGFD will continue to design and implement harvest strategies to ensure elk populations are maintained at established Herd Unit objectives.

4. Cattle Producer Change of Operation

WGFD will work with cattle producers and other agencies (e.g., NRCS, USFS) in the Hoback EHU to implement any changes to their operations that decrease the risk of interspecific disease transmission.

5. Fencing

WGFD will encourage cattle producers in the Hoback EHU to fence areas where hay is stored (stackyards) for winter feeding operations and continue delivery of materials for stackyard construction. WGFD will not pursue large-scale fencing of any lands on the Hoback EHU at this time.

6. Habitat Enhancement

WGFD will continue to coordinate with private landowners, federal land managers, and livestock permittees to develop and implement habitat improvements that may reduce elk dependency on supplemental feed in the Hoback EHU (*Also see*

Appendix 1, section E). Emphasis will be on identifying potential areas for spring and fall range enhancement.

7. Acquisition/Conservation Easements

WGFD will continue to identify and pursue all opportunities to implement this option. Project proposals will be drafted and submitted to various funding agencies to facilitate implementation of this option.

8. Vaccination of Elk Calves

WGFD will continue the ballistic Strain 19 elk vaccination program until adequate data are collected to determine efficacy of the program in reducing brucellosis seroprevalence in elk on feedgrounds.

G. Best Management Practices

In addition to the above options and commensurate with their short- and long-term goals, the following best management practices should be considered for elk feedgrounds. Some may be currently employed, and should be maintained. Others may not be viable options for individual feedgrounds.

Feedground Management

1. Encourage feeders to feed on clean snow.
2. Insist feeders recover any aborted fetus encountered and immediately submit to a regional WGFD office for testing.
3. Minimize feeding duration to maximum extent possible.
4. Where possible, implement large-scale habitat treatments at strategic locations near feedgrounds.
5. Maintain the ballistic Strain 19 elk vaccination program.
6. Prevent elk/cattle co-mingling.
7. Eliminate predator/scavenger control on and adjacent to feedgrounds by WGFD employees or any other personnel associated with feedground operations.

H. Additional Actions

Brucellosis Surveillance

The WGFD currently traps and tests elk for exposure to brucellosis on 4 to 6 feedgrounds annually. This practice should continue on as many feedgrounds as possible annually to monitor prevalence of the disease. Surveillance allows assessments of the efficacy of the Strain 19 vaccination program and other strategies in use. Additionally, hunter-harvested elk brucellosis surveillance will occur annually in an effort to survey the entire state over a 4-year period. Feedground surveillance efforts may be reduced during the Pinedale elk herd unit test and removal pilot project.

Information and Education

WGFD personnel regularly inform and educate various public factions about wildlife diseases, including brucellosis. Outreach, particularly from the Information & Education (I&E) branch, has included group presentations, regular news releases, interpretive signs at feedgrounds and crucial winter ranges, Game and Fish brucellosis website, and various brochures and publications. Participation in the Greater Yellowstone Interagency Brucellosis Committee (GYIBC) and the Wyoming Brucellosis Education Team (WBET) has increased I&E brucellosis efforts on a statewide and regional level.

The importance of quality wildlife habitat and the substantial role fire plays in natural ecosystems are also stressed during public forums, as well as the role of feedgrounds and elk damage management activities. WGFD personnel make numerous private landowner contacts regarding habitat improvement projects, wildlife-friendly management techniques, or ways to prevent co-mingling of elk and livestock. Additional efforts are focused on area school groups and educational exhibits at events such as the WGFD's annual Hunting and Fishing EXPO and the annual elk antler auction in Jackson to inform children and their parents on the Brucellosis-Feedground-Habitat (BFH) program and brucellosis management.

These efforts should be continued to inform the public of WGFD's role in brucellosis management. Additionally, should any of the aforementioned options be officially adopted, I&E efforts should focus on why the option(s) was (were) pursued and what benefits may be realized. The public should be made aware of any proactive management embarked upon by the WGFD, and their interests in the actions should be heard.

Progress Reporting

Efforts associated with this plan and/or the Wyoming Governor's Brucellosis Coordination Team will be summarized and reported on an annual basis.

Research

Sound management of brucellosis in elk on feedgrounds and the risk of transmission from elk to cattle necessitates accurate and reliable data to facilitate decisions. Much of the research concerning brucellosis, feedground elk, and feedground management has focused on elk vaccination. Many aspects of feedground elk ecology, brucellosis transmission and pathology, and feedground management have not been investigated or sufficiently evaluated. Potential research topics that could assist in management decisions:

1. Relationship of seropositive vs. culture positive, and strain of *Brucella*, in feedground elk.
2. Characteristics of scavenging of aborted fetuses on feedgrounds; relationship of coyote densities and scavenging rates on feedgrounds.
3. Feedground elk parturition habitat site characteristics and proximity to cattle.
4. Effects of habitat improvement projects near feedgrounds on minimizing feedground dependence of elk (i.e. distribution, dispersal, length of feeding season, brucellosis seroprevalence).
5. Disease presence (other than brucellosis) and parasite loads in elk on feedgrounds.

6. Abortion and viable birth rates, and temporal and spatial distribution of abortions and births, in seropositive feedground elk.
7. Relationship of brucellosis seroprevalence and feeding duration.
8. Impacts of wolves on distribution of elk using feedgrounds.
9. Collect snow-water equivalency measurements in areas of habitat enhancement projects, both past and future, and explore relationships with elk use and distribution.

I. Literature Cited

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Thorne, E.T., T.J. Walthall, and H.A. Dawson. 1981. Vaccination of elk with strain 19 *Brucella abortus*. Proceedings of the United States Animal Health Association 85: 359-374.

Thorne, E.T., J.K. Morton, and W.C. Ray. 1991. Brucellosis vaccination of free-ranging elk (*Cervus elaphus*) on western Wyoming feedgrounds. *In* The biology of deer, R. D. Brown (ed.). Springer-Verlag, New York, New York, pp. 107-112.

Appendix 1

A. Historic Elk Herd Management

Current Commission feedground quotas are 400 elk at Dell Creek and 600 at McNeel. The quota at Dell Creek was raised from 286 after 1985; the quota for McNeel was raised from 535 at that same time. Higher feedground quotas permitted the total population of the Hoback EHU to increase. Concomitantly, there was a population-objective increase from 900 elk to 1,079 elk in the late 1980s (WGFD 1990). The current post-hunt population objective for the Hoback EHU is 1,100 elk wintering on and off feedgrounds. Hunting seasons have varied somewhat through the years in regards to license types (limited quota and general licenses) along with season length to achieve desired harvest rates. However, the general trend has been for HA 86 to have a longer season that typically opens in September and runs through October; HA 87 has typically opened in mid-October and ran through October with some late seasons structured to harvest elk away from the Dell Creek feedground (east of Dell Creek and north of Highway 191).

Elk Herd and Feedground History

Scattered populations of elk historically wintered along the Cliff Creek drainage during less severe winters (Anderson 1958). Monument Ridge, located along the east side of Cliff Creek, historically wintered a few hundred elk. Anderson (1958) documented 353, 403, and 135 elk wintering in the Monument Ridge area during 1954, 1955, and 1956, respectively. Counts in that area during the 1960s ranged from 75-125 elk (Dave Thomas, pers. comm., *cited in* WGFD 1990). Recreational snowmobile use initiated during the late 1970s and continuing on today has essentially eliminated winter elk use of the Monument Ridge area. Most of the remaining elk range in this EHU is considered spring-summer-fall range (Figure 2).

Organized supplemental feeding, under the supervision of the WGFD, began in the Hoback EHU during the winter of 1956, when both the Dell Creek and McNeel feedgrounds were established (WGFD 1990). Prior to this date, small, scattered groups of elk were fed in association with privately owned livestock. The main precursor to the McNeel feedground began when elk were first fed in 1951 in the field adjacent to the highway on the River Bend Ranch. A year later, the feedground was moved to its present location (Figure 3). The feedground derives its name from Bob McNeel, who fed for about the first 20 years.

Interviews with long-time residents indicate that elk feeding started at Dell Creek in the late 1940s (Figure 4). The WGFD took over the operation in 1956. Approximately 225 elk were fed the first year at Dell Creek feedground.

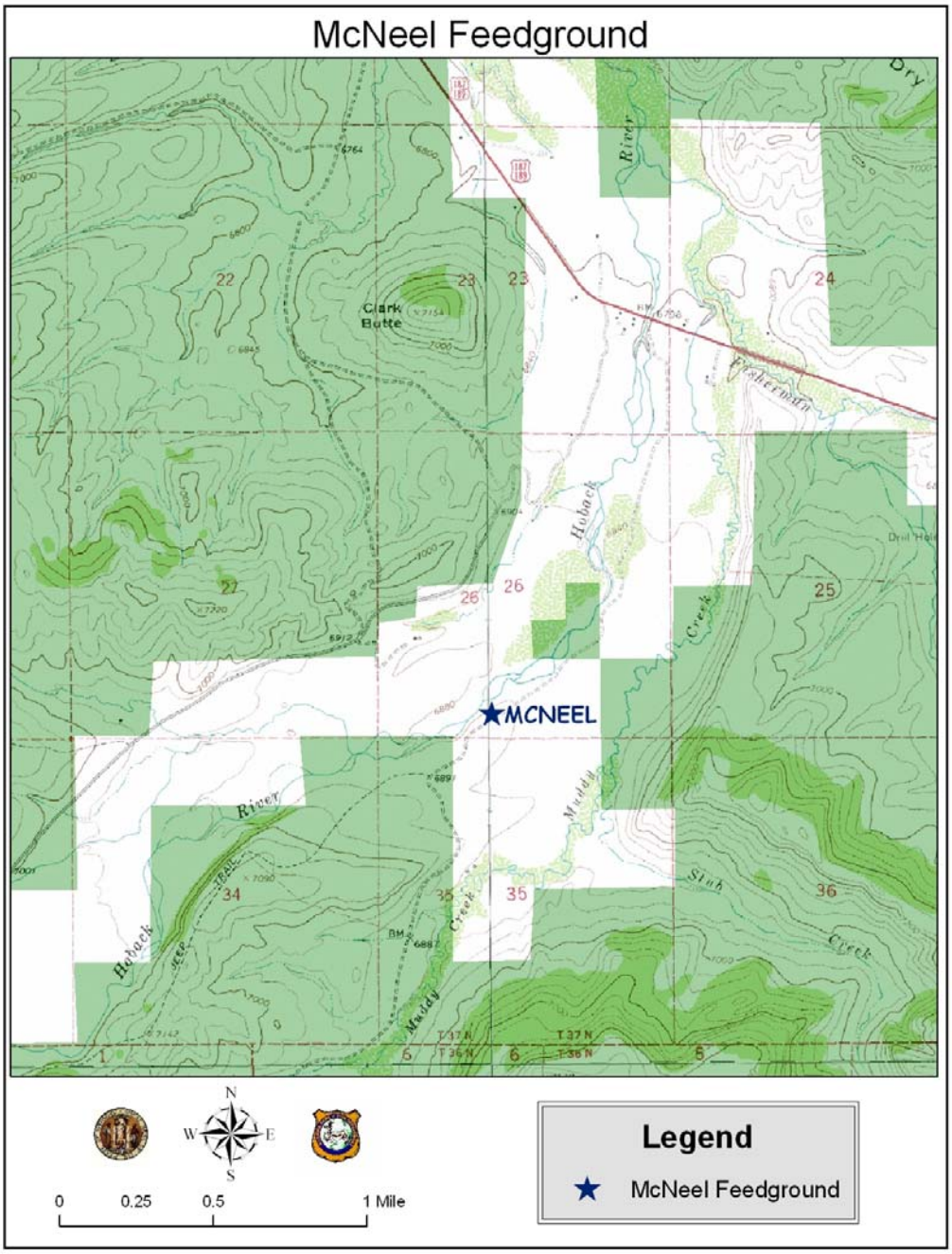

Figure 3. McNeel feedground and vicinity.

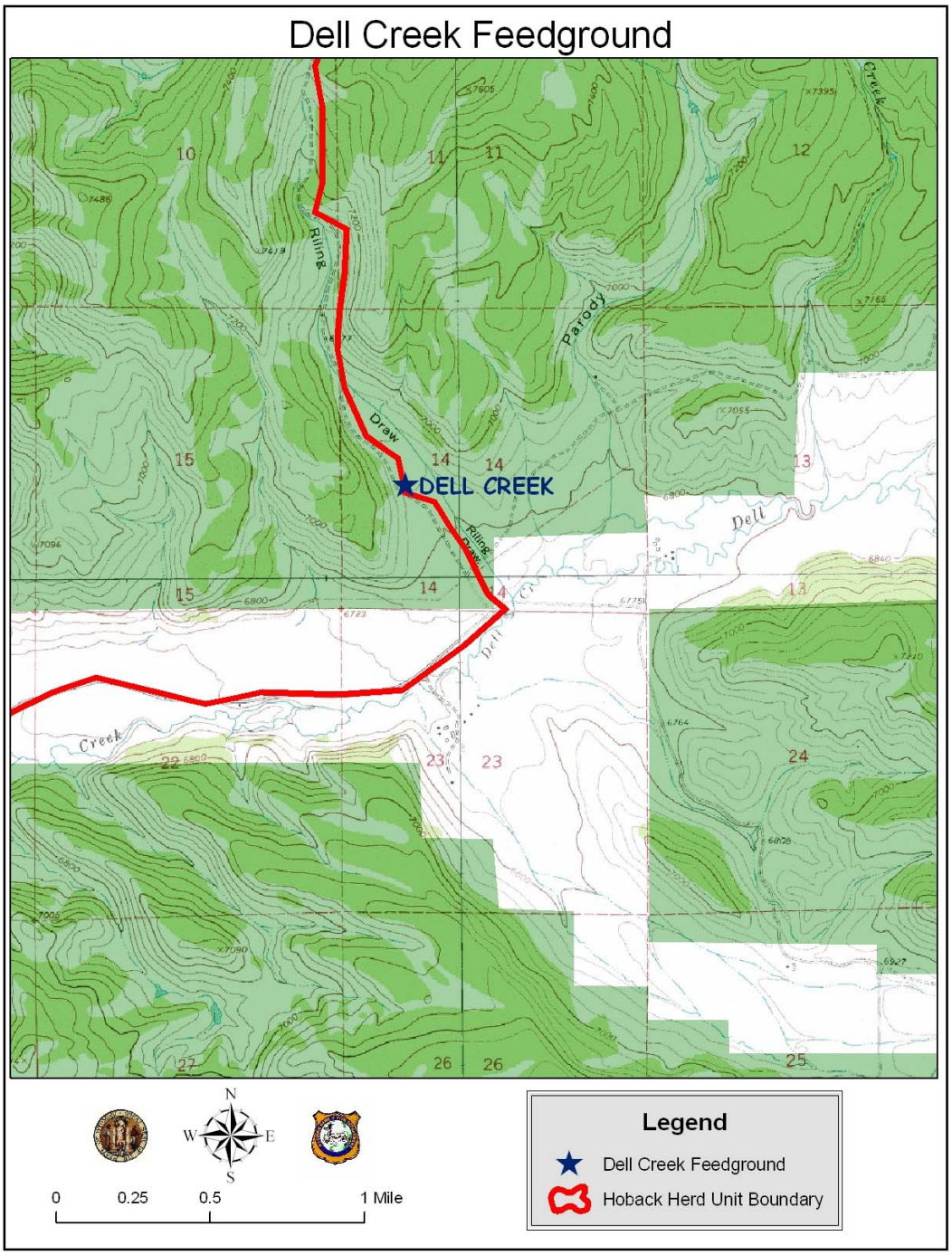

Figure 4. Dell Creek feedground and vicinity.

Damage History

The combination of deep snow accumulations and a primarily privately-owned valley floor has been cause for a long history of private-property damage by elk in the Hoback EHU. Property damage has included damage to shrubs, fences, haystacks, growing alfalfa crops, and co-mingling with livestock.

Techniques for preventing elk damage have included fencing haystacks, hazing animals away from the damage source, bait lines, emergency feeding operations to attract elk away from damage and co-mingling situations, trap and removal operations, hunting seasons structured to prevent damage, and noise-making devices such as propane cannons, fuse rope, cracker shells, etc. In some years, despite these efforts, not all damage has been preventable and some landowners have received monetary compensation (Figure 5). The winter of 1993-1994 was particularly expensive to the WGFD, as they paid almost $16,000 to one producer for damage to hay. However, no damage claims have been submitted to the Department since 1997.

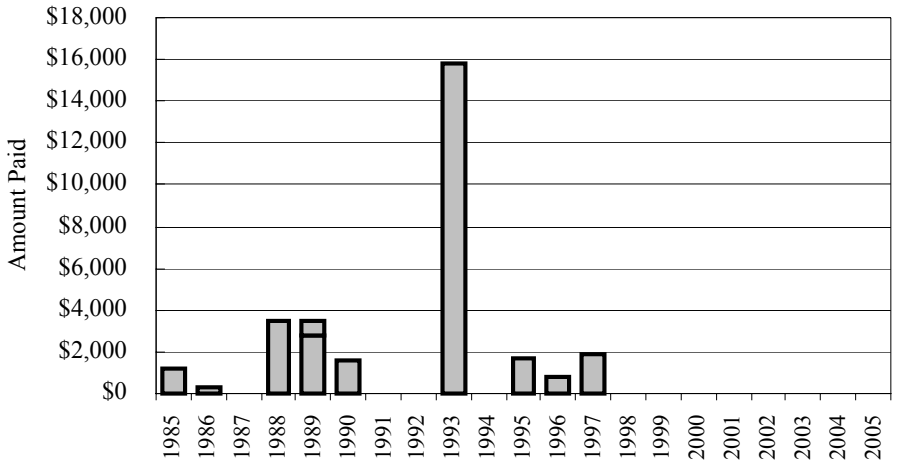

Figure 5. Damage claims (increments indicate individual claims) paid to landowners by WGFD for damage caused by elk from fiscal year 1985 through 2005 in the Hoback EHU. Claims do not reflect expenses incurred by WGFD for damage prevention activities. (*Sources*: WGFD 1990, WGFD unpublished data)

B. Current Elk Herd Management

The Hoback EHU is "leaky" in regards to elk moving in and out of the herd on a seasonal basis. Fluctuations of 100 or more animals between annual winter counts are common. Direct counts of elk on feedgrounds and hand calculations of the estimated population size seem to assess population dynamics fairly well, especially in heavy snow years given the limited native winter range and increased attendance at feedgrounds. The 2005-06 winter started with very mild conditions, but as winter progressed, conditions changed to above normal snow pack levels. The 2005 post-hunt counts tallied 1,044 elk-roughly 100 more elk than the 2004 counts (Figures 6 and 7). A higher proportion of the population was probably counted because of greater than normal winter conditions. Below average harvest also would have contributed to the higher count.

The 2006 hunting seasons are designed to maintain the Hoback elk herd within 10% of the population objective of 1,100. For the fifth consecutive year, hunting seasons

in Area 87 will offer general licenses (i.e., any antlered or antlerless elk) for hunting the entire season. A total of 30 limited quota (Type 6- cow/calf) licenses will again be offered in a portion of Area 87, valid from November 19 through January 31, in an effort to reduce damage to privately stored hay crops.

The season in HA 86 will offer 19 days of general license, any elk hunting from September 26 through October 14. This season will limit harvest to antlered elk only from October 15-31 in an effort to maintain the population near desired levels in this HA.

Population Estimate

The 2005 post-hunt population estimate of 1,160 elk increased from the 2004 estimate of 1,025 elk. The population estimate was derived by hand calculations which provide a more accurate representation of herd dynamics based on postseason trend counts, herd composition, and field checks of hunter-harvested elk. Hand calculations have proven effective at depicting population levels since the 1970s because the development of a workable and effective POP2 model has been difficult to achieve. POP2 model estimates do not track with observed trend counts due to the interchange of animals with surrounding herd units, violating the "closed" population assumption. The population objective is 1,100 elk.

Trend Count and Herd Composition

During 2005 postseason trend counts, 1,044 elk were observed on Department-operated feedgrounds and native winter ranges (Figures 6 and 7). A total of 70 elk were counted away from established feedgrounds in HAs 86 and 87. In HA 87, a total of 258 elk and 716 elk were counted on the Dell Creek and McNeel feedgrounds, respectively.

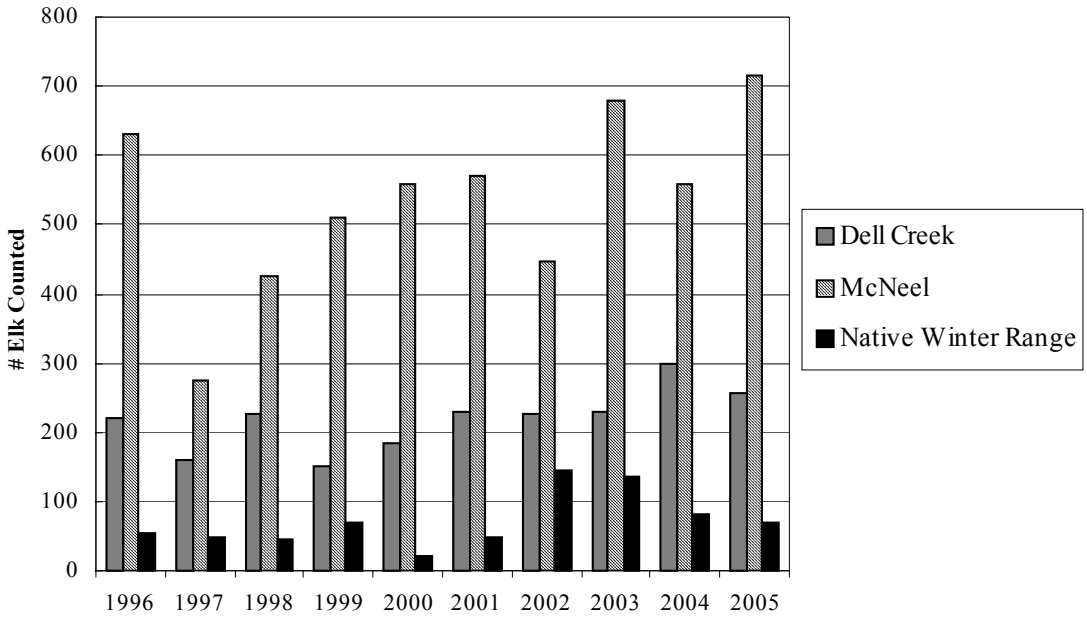

Figure 6. Number of elk counted on Dell Creek and McNeel feedgrounds and native winter range during annual post-hunt trend counts. (2004: winter range includes 70 elk counted on private horse feedline; 2005: winter range includes 60 elk counted on private horse feedline.)

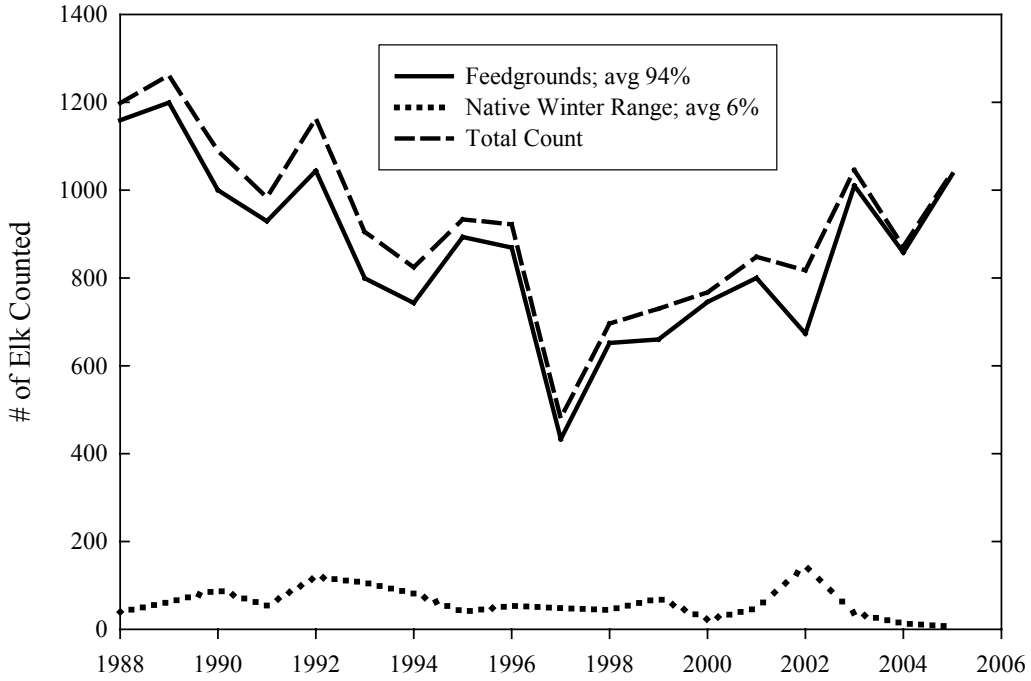

Figure 7. Number of elk counted in the Hoback EHU on feedgrounds (both feedgrounds combined) and on native winter range during annual post-hunt trend counts, 1988-2005. The herd objective is 1,100 elk. 2004 and 2005 native winter range counts do not include 70 and 60 elk counted on private horse feedlines, respectively.

The 2005 post-hunt ratios were 16 bulls: 100 cows: 38 calves (Figure 8). Compared to 2004, the 2005 bull: cow ratio remained the same and the calf: cow ratio increased to 38:100. Over the last five years, the average bull:cow:calf ratio is 18:100:39. Adequate bull:cow:calf ratios are being maintained with past management strategies.

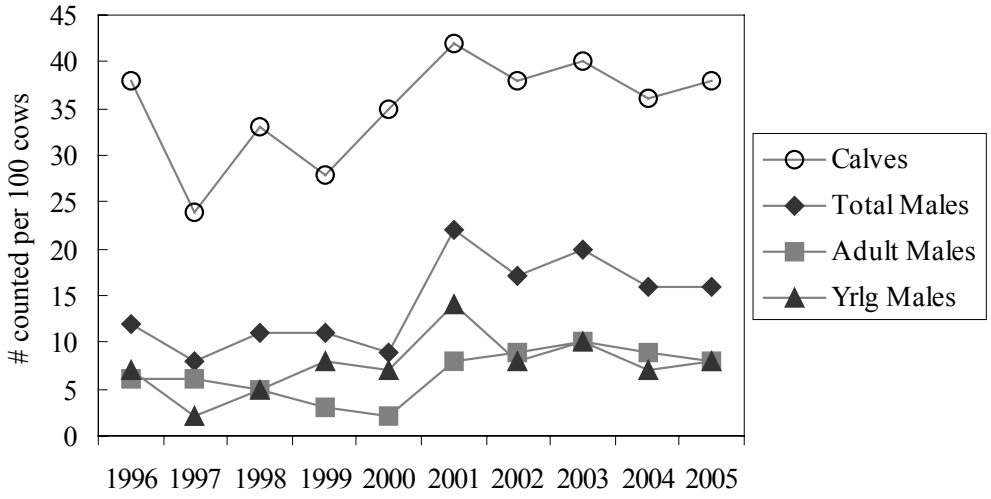

Figure 8. Ratio of calves, bulls, and spikes per 100 cows counted during annual post-hunt trend counts in the Hoback EHU, 1996-2005.

Harvest

The continuation of general license, any elk hunting seasons in HA 86, and limited number of days of general, any elk hunting in HA 87 have proven successful at maintaining this population near the objective over the last several years. In 2005, a total of 151 elk were harvested according to the harvest survey. A total of 54 adult bulls, 26 yearling bulls, 52 cows, and 19 calves were reported (Figure 9). The 2005 harvest represents the lowest harvest documented in the past 10+ years.

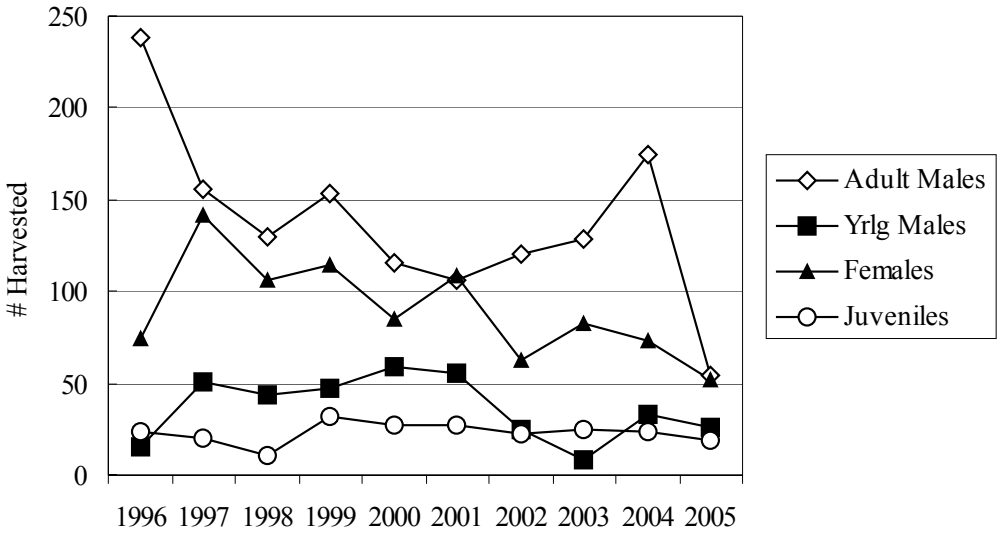

Figure 9. Harvest trends in the Hoback EHU, 1996-2005.

Hunter Success

Hunter success in 2005 was 18%. Hot and dry weather during the fall of 2005 provided tough hunting conditions that resulted in lower than average harvest and success rates. The increase in fuel prices during the late summer may have also contributed to lower harvest levels, as hunter recreational days were lower than normal. Over the past five years, harvest has averaged 275 animals (Figure 9) and hunter success has averaged 30%.

Ear Tag Returns

A tagging program has been conducted periodically in conjunction with brucellosis surveillance activities in an effort to increase understanding of elk movements in and out of the Hoback EHU. Animals have been trapped and tagged annually at Dell Creek feedground since 1998. Elk were also trapped at Dell Creek in 1989. Elk were trapped and tagged at the McNeel feedground in the winters of 1996-97 and 1997-98. An evaluation of all known-location tag returns (n = 107) from elk tagged within the Hoback EHU (1996-2005) indicates that 30% (n = 32) of tagged elk were killed outside the herd unit boundaries (Table 2).

Table 2. Known harvest locations of elk trapped and tagged in the Hoback EHU, 1996-2005. From 1996-2005, 664 elk were trapped and tagged.

Location of Harvest	# of Tagged Elk Harvested	% of Tag Returns	% of All Tagged Elk
Hoback EHU	76	68.5	11.4
Fall Creek EHU	20	18.0	3.0
Upper Grn. EHU	5	4.5	0.75
Piney EHU	4	3.6	0.6
Jackson EHU	2	1.8	0.3
*Wiggins Fk. EHU	1	0.9	0.15
Unknown	4	3.6	0.6
	n = 112	16.9	*n* = 664

*In HA 69- east of the Continental Divide.

C. Feedground Management

The feedgrounds in the Hoback EHU are situated on elk summer range. These feedgrounds are located where winter conditions start early in the fall and remain into the late spring. Thus, winter survival of elk in this area depends almost totally on supplemental feed.

The presence of cattle near these feedgrounds has additionally dictated long feeding seasons in the past. The feedgrounds of the Hoback EHU typically run the longest, and consequently, cost the most (per elk) to operate.

A livestock ranch is located adjacent to the Dell Creek feedground, which places considerable importance on feeding to prevent damage and co-mingling. Cattle are sometimes fed within 200 yards of the feedground with nothing separating them other than a livestock fence.

Recent changes (around 2000) in land use around the McNeel feedground have eased concerns for damage and co-mingling problems. Cattle have not been present near the McNeel feedground for several years and the operation of this feedground has become markedly different from that of Dell Creek. As a result, McNeel now has a shorter feeding season, less hay is fed, and costs are less than those of Dell Creek. The primary concern at the McNeel feedground is trying to keep elk from leaving and going to the Franz feedground (Piney EHU). The potential for damage is much greater at Franz than it is at McNeel.

The feedgrounds of the Hoback EHU typically account for about 6% of the elk fed and 7% of the elk feeding costs for the Region. The cost per elk, however, in this EHU is about $10 more than the overall feedground average ($62.78). The higher cost per elk is the result of a feeding season that averages 22 days longer than the overall average (Figure 10). Fewer elk are fed in this EHU than in any other in the Jackson/Pinedale Region (JPR, Figure 10).

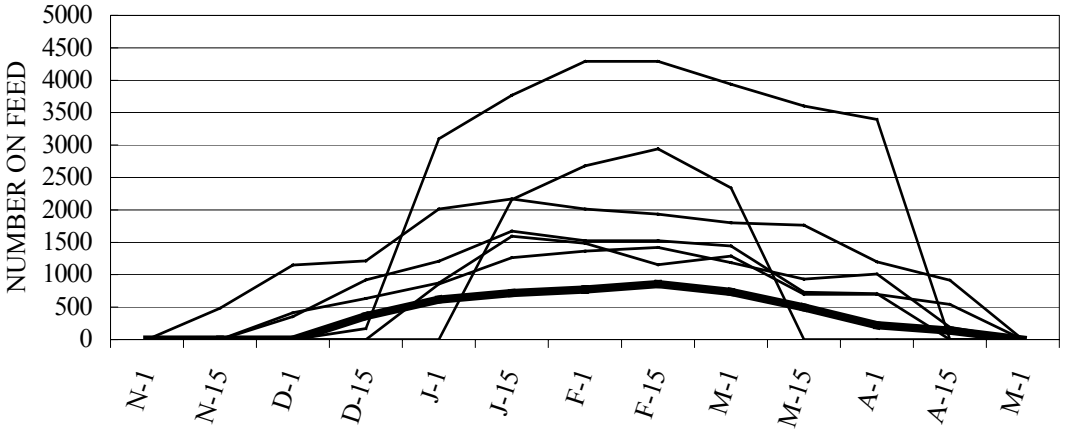

Figure 10. Length of feeding season and number of elk on feedgrounds, for the Hoback EHU (bold line) and the other herd units in the JPR during the winter of 2004-05.

Dell Creek

The 2006-2007 feeding season was initiated on November 15th/16th. The close proximity to cattle on the Little Jenny Ranch generally necessitates an early initiation of feeding. The 2005-2006 season at Dell Creek ran from December 1- April 30 (Figure 11). The 181-day feeding season was slightly longer than the long-term average (176 days).

The 258 elk fed at Dell Creek in 2005-2006 was close to the long-term average (Table 3). The Commission ceiling is 400 elk, and this number has never been exceeded. The feeder did not observe any dead elk during the winter.

The maximum estimated amount of hay fed in 2005-2006 (0.78 ton/elk) was equal to the long-term average (Figure 12), but was 50 % greater the average for the Region (Table 4). The cost was $103/elk (Table 3). This cost was exceeded only by the Finnegan feedground (Piney EHU) and was $38 over the Regional average (Table 4).

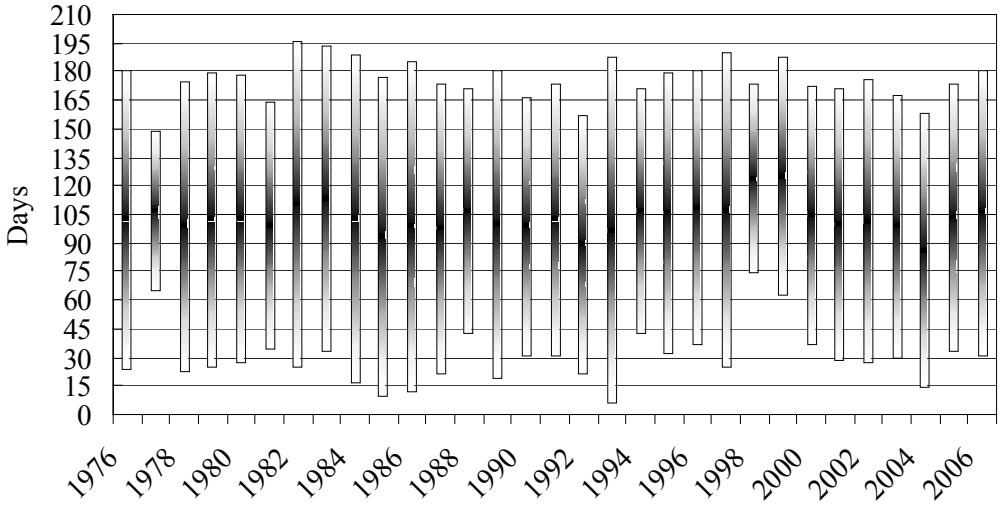

Figure 11. Beginning date, ending date, and days fed at Dell Creek feedground since 1975-76 (0 on y axis = November 1st).

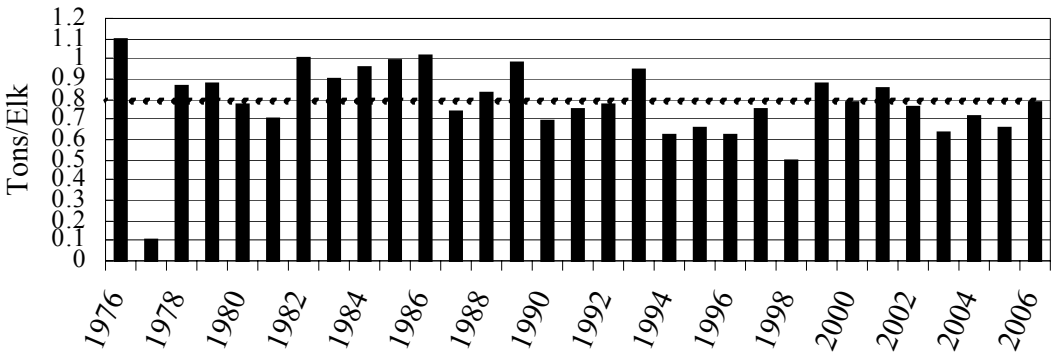

Figure 12. Maximum estimated tons of feed per elk per year at the Dell Creek feedground since 1975-76. The dashed line indicates the long-term average.

Table 3. Summary data from the Dell Creek feedground since 1975-76.

Year	# Elk	Tons Fed	Days	# Dead	Cost/Elk ($)	Tons/Elk
1975-76	259	285	158	3	66	1.10
1976-77	365	28	84	0	9	0.10
1977-78	350	300	154	4	55	0.86
1978-79	265	234	155	3	59	0.88
1979-80	245	188	153	1	59	0.77
1980-81	200	140	131	0	64	0.70
1981-82	234	234	172	5	87	1.00
1982-83	225	203	156	0	86	0.90
1983-84	290	277	176	3	83	0.96
1984-85	230	228	169	2	91	0.99
1985-86	300	305	175	0	90	1.02
1986-87	320	238	156	3	68	0.74
1987-88	235	195	130	2	81	0.83
1988-89	285	278	163	2	89	0.98
1989-90	320	221	136	2	81	0.69
1990-91	275	206	143	2	80	0.75
1991-92	214	164	138	1	85	0.77
1992-93	246	234	184	1	107	0.95
1993-94	234	145	128	0	66	0.62
1994-95	255	168	148	0	75	0.66
1995-96	290	179	146	0	71	0.62
1996-97	220	193	166	1	118	0.75
1997-98	159	80	100	1	82	0.50
1998-99	225	191	156	1	103	0.84
1999-00	150	119	137	0	104	0.79
2000-01	185	158	144	1	109	0.85
2001-02	245	185	149	0	115	0.76
2002-03	225	141	139	1	90	0.63
2003-04	275	195	146	0	93	0.71
2004-05	298	198	141	0	86	0.66
2005-06	258	202	151	0	103	0.78
Average	**254**	**197**	**148**	**1.3**	**$82**	**0.78**

Table 4. Feeder and hay costs (per elk), and rate of feeding (tons/elk) at each WGFD operated elk feedground in the winter of 2005-2006.

Feedground	Cost/Elk ($)[1]	Feedground	Tons/Elk
Finnegan	141	Finnegan	0.90
Dell Creek	**103**	Jewett	0.79
Jewett	91	**Dell Creek**	**0.78**
Black Butte	84	Black Butte	0.70
Camp Creek	84	Camp Creek	0.70
Franz	83	Greys River	0.67
Fall Creek	80	Franz	0.65
McNeel	**77**	Fall Creek	0.63
Greys River	75	**McNeel**	**0.63**
Scab Creek	73	Scab Creek	0.58
Dog Creek	65	Dog Creek	0.58
Muddy Creek	63	Forest Park	0.58
Forest Park	62	Horse Creek	0.55
Fish Creek[2]	62	South Park	0.54
Horse Creek	60	Fish Creek	0.49
South Park	58	Bench Corral	0.48
Bench Corral	55	Muddy Creek	0.47
Soda Lake	54	Soda Lake	0.46
Upper Green	49	Upper Green	0.35
Patrol Cabin[2]	36	Patrol Cabin	0.30
North Piney	20	North Piney	0.14
Alkali[2]	14	Alkali	0.08
2005-2006 Avg.	**$64.69**		**0.551**

[1] Costs include feeder compensation and hay, and do not include administration, management, or maintenance.
[2] Elk move among the three Gros Ventre feedgrounds throughout the winter.

McNeel

Feeding was initiated at McNeel feedground on November 22nd of the current year. In the winter of 2005-2006, feeding began on the McNeel feedground on November 16th; feeding ended on April 17th. The ending date was close to the long-term average. However, the start date was almost two weeks earlier than average, making the 2005-2006 feeding season at one of the longest in the last ten years for the McNeel feedground (Figure 13 and Table 5).

The number of elk fed (716) was 156 more elk than the previous winter (Table 5). This number is far above the long-term average (582) and is far above the Commission ceiling of 600 elk. The feeder observed four dead elk on the feedground during the feeding season.

The elk were fed a maximum estimated average of 0.63 ton/elk for the winter (Figure 14). This amount of feed is typical of the long-term average, but was above the Region-wide average for the season (Table 4). The cost per elk ($77) was greater than the Region average (Table 4), but typically the cost per elk at McNeel is much lower (Table 5).

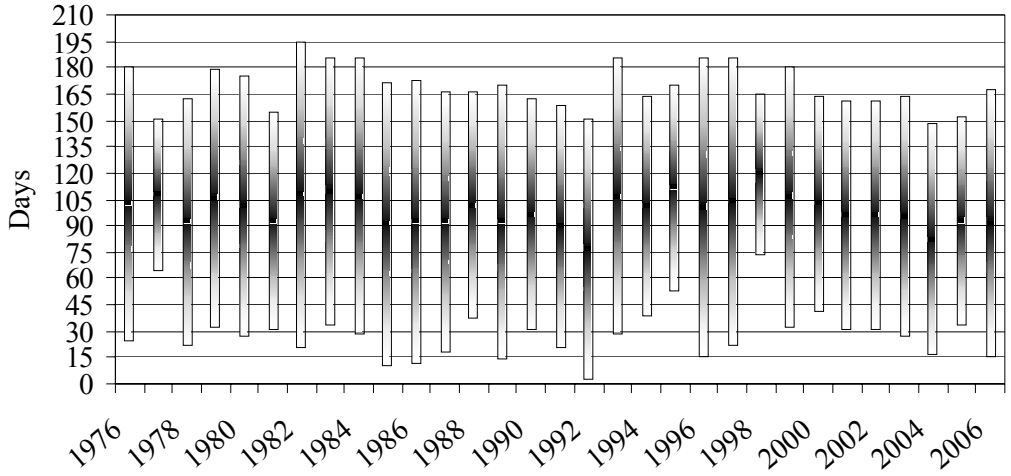

Figure 13. Beginning date, ending date, and days fed at McNeel feedground since 1975-76 (0 on y axis = November 1st).

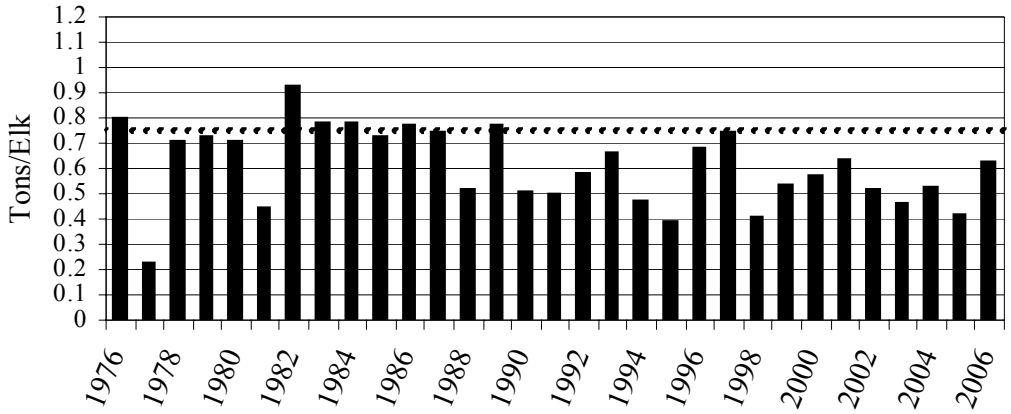

Figure 14. Maximum estimated tons of feed per elk per year at the McNeel feedground since 1975-76. The dashed line indicates the long-term average.

Table 5. Summary data from the McNeel feedground since 1975-76.

Year	# Elk	Tons Fed	Days	# Dead	Cost/Elk ($)	Tons/Elk
1975-76	590	472	158	6	46	0.80
1976-77	450	103	87	0	20	0.23
1977-78	650	463	141	4	44	0.71
1978-79	633	465	145	3	47	0.73
1979-80	530	376	150	7	50	0.71
1980-81	475	215	126	0	40	0.45
1981-82	438	406	179	2	76	0.93
1982-83	435	341	153	2	81	0.78
1983-84	500	392	162	0	66	0.78
1984-85	430	314	163	3	82	0.73
1985-86	560	431	163	3	68	0.77
1986-87	570	429	149	3	63	0.75
1987-88	700	366	130	1	44	0.52
1988-89	850	652	158	8	71	0.77
1989-90	1003	515	137	10	56	0.51
1990-91	736	366	138	1	50	0.50
1991-92	729	426	150	8	57	0.58
1992-93	789	522	159	3	67	0.66
1993-94	565	266	126	0	45	0.47
1994-95	488	189	119	6	42	0.39
1995-96	603	410	173	12	72	0.68
1996-97	630	470	164	10	86	0.75
1997-98	274	112	91	5	60	0.41
1998-99	427	231	149	9	62	0.54
1999-00	500	286	123	5	63	0.57
2000-01	500	321	131	2	75	0.64
2001-02	570	299	131	7	70	0.52
2002-03	448	206	137	0	62	0.46
2003-04	680	364	133	9	65	0.53
2004-05	560	235	119	0	53	0.42
2005-06	716	452	153	4	77	0.63
Average	**582**	**358**	**142**	**4.3**	**$60**	**0.61**

Feedground Operational Goals

On April 2, 1997, the Director of the WGFD issued a statement identifying feedground management goals:

1. Provide nutritional supplement to wintering elk that frequent elk feedgrounds
2. Prevent where possible, the co-mingling of elk on cattle and horse feedlines
3. Control brucellosis within elk on feedgrounds by vaccination
4. Minimize other damage conflicts on private lands

These directives do not differ from the Jackson/Pinedale Region's existing long-term goals. Long-term objectives are to supplement the winter diet of elk in a manner that prevents excessive starvation, reduces risk of disease transmission to domestic livestock, and/or helps prevent damage to private property. Concurrently while accomplishing these objectives, opportunities to minimize the dependency of elk on supplemental feed have been taken.

Several management decisions must be made annually on each feedground. Depending on the situation, some may be implemented and others may not. Some are in direct contrast with others and those given preference depend upon individual situations. The following are issues that should be considered at each feedground.

1. Can the dependency of elk on supplemental feed be reduced? Even though other issues may be given preference, reducing the dependency on feedgrounds should be considered when making all decisions regarding the operation of the feedgrounds. Reducing the length of the feeding season may reduce the spread of disease and will reduce feeding costs.
2. Does the feedground assist in preventing damage/co-mingling? Feeding elk is an effective method of keeping elk from private property.
3. What can be done to keep feedground operating costs as low as possible? The amount of hay fed (influenced primarily by amount fed daily and the length of the feeding season) represents most of the cost to the feedground program. Any reduction in the amount of hay fed decreases the cost of the program.
4. How to feed in a manner that provides the most sanitary conditions? This usually involves keeping the feedgrounds as large as possible and feeding on fresh snow as much as possible.
5. Attempt to feed just enough to keep the elk in good body condition, but not low enough to compromise damage concerns. This level of feeding is less than what the elk can and will consume if offered more. Feeding should not be adjusted to attempt to keep old and/or crippled elk alive. A good rule of thumb is to feed enough to keep calves healthy for the first part of the winter, and then feed enough to keep pregnant cows in good nutritional condition during the later part of the winter. It is these two age groups (calves on the feedground and those that will be born in the spring) that are most susceptible to reduced nutrient intake.
6. Attempt to feed at rate that will satisfy the elk's appetite when the potential damage problems exist. This feeding rate is basically feeding "all they will eat" and is in excess of the physiological need of the animals, but the additional feed will keep the elk from wandering in search of more food (thus reducing the possibility of causing damage).

Feedground Operational Plans (*Revised March 14, 2001*)

There are two feedgrounds that are located in the Bondurant area. This is an area of very high snowfall along with low temperatures during the winter months.

Dell Creek

The Dell Creek feedground is on USFS property and is very near the Little Jenny Ranch. This ranch runs about 1,000 head of breeding cows and has had brucellosis in their herd previously. To test and retest this number of cows requires a tremendous amount of time and effort. For this reason (and others), it is imperative that feedground elk do not co-mingle with these cattle.

Deep snow accumulations are normal. It is difficult to break new feedlines once snow depths exceed a couple of feet, and as a result, the opportunity to scatter the elk is not as great here as it is on other feedgrounds. Commission quotas allow 400 elk here.

Primary Management Issues

1. The feedground is located within one mile of the Little Jenny Ranch, where there is stored hay and cattle feedlines. Given the large number of breeding cows on the ranch, elk from this feedground should not be implicated immediately, should brucellosis be found in this herd. All feeding efforts should be directed at minimizing the possibility of feedground elk co-mingling with cattle.
2. This feedground serves as the control (elk not vaccinated) when evaluating the effectiveness of brucellosis vaccination at other feedgrounds. The trapping and taking of blood samples from these elk is very important.

Secondary Management Issues

1. Deep snow limits the ability to break new feedlines. However, every effort should be made to keep hay scattered when possible.

Management Suggestions/criteria

1. Elk begin appearing on the hills around the feedground as snow depths reach 8-10 inches. Feeding should begin when the elk move onto the feedground itself and adjacent areas and no longer move around in search of food. Usually, the first hay is put out before snow depths preclude using a pickup for feeding.
2. Feeding can be terminated in the spring when the elk begin feeding away from the feedground and hay consumption begins to decline.

McNeel

This is the only feedground that is restricted to private property. An annual lease fee is paid for the use of this feedground and WGFD is currently under a 25-year lease agreement with Gilman Ordway (River Bend Ranch) beginning September 1, 2005.

The existing feedground structures are immediately adjacent to the Hoback River. Some structures have been lost in the past due to high spring run-offs and the existing stackyard/hayshed could be lost if the river rose above existing flood control barriers. The area where the elk are fed is an irrigated hay meadow that produces hay. Given the deep snow in Bondurant, it can be a challenge to keep new feedlines broke open. Commission quotas allow 600 elk to be fed at this location.

Primary Management Issues

1. The presence of cattle feeding operations that previously drove many of the feeding management decisions no longer exist near the feedground. The most significant concern is to feed the elk early enough to keep them from moving over the Hoback Rim (several miles) and either onto the Franz Feedground and/or onto private property beyond Franz.
2. Good quality hay should be fed early in the feeding season to entice the elk to stay at this location. Concerns of having the elk leave get less as snow depths increase.
3. Efforts must be made to keep the feedground free of loose baling twine. Also, feedlines must be moved frequently to prevent the build-up of old hay and manure. It may be necessary to use heavy equipment to break new feedlines.

Secondary Management Issues

1. None.

Management Suggestions/criteria

1. Feeding should be initiated when elk first move onto the feedground in an effort to keep them at this location and reduce the risk of them migrating to the Franz feedground.
2. It is not likely that these elk will cause damage in the spring. Feeding can be terminated in the spring as soon as the snow has left some of the slopes, and hay consumption begins to drop.

D. Brucellosis Management Summary

The WGFD developed an integrated program in an attempt to manage brucellosis in free-ranging elk associated with feedgrounds in the late 1980s. This approach, called the Brucellosis-Feedground-Habitat (BFH) Program, combines six ongoing management activities: feedground elk vaccination, feedground management, habitat enhancement, elk/cattle separation, brucellosis education, and scientific research. Goals established in 1989 were to: maintain spatial and/or temporal separation of elk and cattle during brucellosis transmission risk periods, reduce prevalence of brucellosis in elk through vaccination and habitat improvements, and work with all affected interests in trying to eliminate brucellosis in the GYA.

To address these goals, BFH and other WGFD personnel conduct the following activities.

Vaccination

Vaccination was conducted over six days in late February and early March 2006. A total of 168 of the 184 calves classified (92%) were vaccinated. Vaccination was initiated on the McNeel feedground in 1992. Since that time, a total of 2,191 juveniles and 704 adult females have been vaccinated (Table 6).

No strain 19 activity has taken place at the Dell Creek feedground, as this population serves as a control to compare serology with other vaccinated feedground elk. Active surveillance is presently ongoing.

Table 6. 1998-2006 vaccination summary for Dell Creek and McNeel feedgrounds. Dell Creek feedground serves as a control in evaluating the vaccination program, therefore has never been vaccinated.

		Classification			Calves Vaccinated	
Year	Feedground	Calves	Females	Total Elk	Number	% of Classified*
1998	Dell Creek	28	116	159	0	
1998	McNeel	45	217	274	42	93%
1999	Dell Creek	49	152	225	0	
1999	McNeel	102	305	427	94	92%
2000	Dell Creek	28	104	150	0	
2000	McNeel	95	335	455	126	>100%
2001	Dell Creek	34	140	185	0	
2001	McNeel	131	331	490	119	91%
2002	Dell Creek	49	147	230	0	
2002	McNeel	157	?	?	165	>100%
2003	Dell Creek	57	141	225	0	
2003	McNeel	105	307	448	120	>100%
2004	Dell Creek	51	152	230	0	
2004	McNeel	175	429	680	164	94%
2005	Dell Creek	59	195	298	0	
2005	McNeel	144	375	560	131	91%
2006	Dell Creek	58	163	258	0	
2006	McNeel	184	472	716	168	92%

* >100% coverage suggests some yearlings may have received S19 dose.

Serology

The WGFD initiated brucellosis surveillance of elk on the Greys River feedground and National Elk Refuge in 1971 to monitor the distribution and prevalence of the disease. Currently, BFH and other WGFD personnel trap, bleed, and test elk on 4 to 6 feedgrounds annually. Several thousand (4,272) yearling and adult female elk trapped on 21 different feedgrounds have been tested to date (post-winter 2005-06). Elk on McNeel feedground were trapped and tested in the winters of 1997 and 1998 (Table 7).

Four tests are used to evaluate elk sera; the standard plate agglutination test (SPT), the buffered *Brucella* antigen rapid card test (BBA), the rivanol precipitation-plate agglutination test (RIV), and the complement fixation test (CF). Seroprevalence is determined using procedures published in USDA-APHIS, 1998. Sera that produce a reaction on two or more tests, or if the CF test alone shows a reaction at a dilution rate of 2+ 1:20 or higher, are considered positive. Once serostatus is determined using these criteria, the cELISA (competitive enzyme-linked immunosorbent assay) is conducted on

positive sera to differentiate between Strain 19 vaccine and field strain *Brucella abortus* titers. Seroprevalence indicates the animal has been exposed to *Brucella* and has formed an antibody response, but does not determine presence (or infection) of *Brucella* within the animal.

Table 7. Number of yearling, adult, total female, and % seroprevalence of elk tested on Hoback EHU feedgrounds as determined by 4 standard tests and cELISA.

		# Tested			% Seroprevalence	
Feedground	**Year**	**Yearling**	**Adult**	**Total**	**4 Standard**	**cELISA**
Dell Creek	1989	4	19	23	61	*
	1998	8	26	34	47	26
	1999	9	28	37	62	50
	2000	7	15	22	45	45
	2001	14	21	35	31	26
	2002	12	22	34	38	35
	2003	10	20	30	40	37
	2004	8	28	36	8	8
	2005	4	30	34	18	18
	2006	6	24	30	17	17
	Sum	**82**	**233**	**315**	**36**	**29**
McNeel	1997	0	2	2	0	*
	1998	1	10	11	64	*
	Sum	**1**	**12**	**13**	**54**	**N/A**

* cELISA test not conducted

Dell Creek feedground is the only state-operated feedground where elk vaccination is not conducted. Distribution data of elk from this feedground suggest little interchange with surrounding feedgrounds, thus providing a suitable control to compare elk vaccination efficacy with other feedgrounds. Brucellosis surveillance was initiated on Dell Creek in 1989, and has since been conducted from 1998-2006. In 2006, a total of 87 elk (62 newly tagged) were trapped over four trap days. The desired sera sample from 30 yearling and adult females was achieved. Brucellosis seroprevalence for yearling and adult females remained substantially below the long-term average of elk on this feedground for the third consecutive year at 17% (n=5/30), as determined by the four standard and cELISA tests. Serology data using cELISA (Table 8) indicate *Brucella* seroprevalence averages 29% (+/- 13.8) on Dell Creek, and has fluctuated from 8% in 2004 to 50% in 1999. More data are needed on all feedgrounds to more accurately assess efficacy of the Strain 19 vaccination program.

Table 8. Yearly and total % seroprevalence (with number of elk sampled) as determined by the cELISA test on Dell Creek feedground.

Year	Dell Creek*
1998	26 (34)
1999	50 (36)
2000	45 (22)
2001	26 (35)
2002	35 (34)
2003	37 (30)
2004	8 (36)
2005	18 (34)
2006	17 (30)
Total	**29% (291)**

*Dell Creek is a control and has never been vaccinated.

Elk/Cattle Disease Transmission Reduction

Annually, WGFD personnel employ a variety of damage control techniques to maintain spatial and temporal separation of elk and cattle. The WGFD has a long-standing practice of providing game-proof stackyard fencing to private producers to prevent elk from depredating privately owned stored hay crops and to discourage elk from frequenting cattle feeding areas. By preventing elk from establishing feeding patterns in cattle wintering areas, the potential for interspecific brucellosis transmission may be diminished. Since 1992, elk-proof fencing materials for 173 haystacks (as of May 2006) have been provided by WGFD personnel to cattle producers in Lincoln, Sublette, and Teton counties in western Wyoming. WGFD records indicate that materials for at least six stackyards have been provided to cattle producers in the Hoback EHU.

In some instances, elk are hazed from cattle feeding sites. These animals are removed from areas of conflict via snowmobiles or aircraft to WGFD feedgrounds. In other cases, when the aforementioned management actions fail to achieve desired results, special depredation hunting seasons or kill permits are employed to remove problem animals (*Also see* Appendix 1, section A).

Since 1999, BFH personnel have monitored areas where elk parturition and cattle turn-out dates overlap (Figure 15). During the elk calving period from late May to mid June, a potential risk of brucellosis transmission to cattle on overlapping ranges exists. Twelve public land grazing allotments in 3 counties have been identified as potential risk areas. Eleven of 12 risk areas showed no elk/cattle interaction from 1999-2005. Coordination and education efforts with land managers and grazing operators will be initiated to resolve elk/cattle interaction if and when conflict areas are identified.

Biological Control- Scavenging

Several WGFD personnel working with feedgrounds have suggested that retaining viable populations of scavengers on and adjacent to feedgrounds may increase the scavenging rate of aborted fetuses. Ultimately, this "biological control" likely reduces the risk of intra-specific transmission of brucellosis. In March 2005, 6 pseudo-aborted fetuses and respective placentas (hereafter termed fetal unit) were placed on Franz feedground to determine how quickly fetal units were removed from the feedground.

During this study, fetal units were removed from 3.33hr to 24hr (mean = 14.9hr) after placement on the feedground; coyotes and eagles were considered the primary scavengers. In March and April 2006, 29 fetal units were distributed among and placed on Franz, Soda Lake, Muddy Creek, and Alpine feedgrounds, and 4 fetal units were place in Buffalo Valley (non-feedground), northeast of Jackson, WY. Mean scavenging rate on the feedgrounds was 18.99hr vs. 33.37hr in Buffalo Valley, suggesting that scavengers are actively selecting feedgrounds as feeding sites and likely reducing risk of intra-specific transmission of brucellosis. Coyotes and eagles were again identified as primary scavengers with the addition of foxes. Based on the results of these two studies, scavengers are likely a viable form of biological control for brucellosis. Control of scavengers on and adjacent to feedgrounds should be prevented.

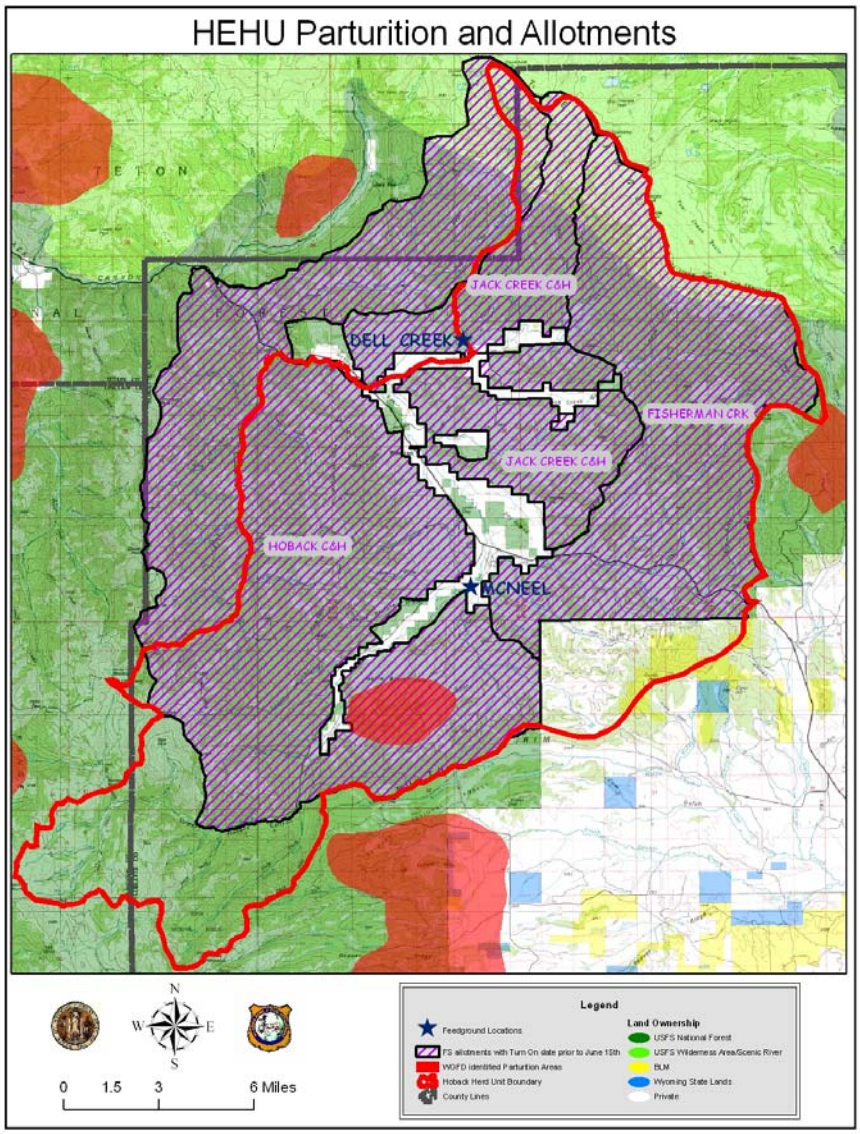

Figure 15. Elk parturition areas and overlap with public-land cattle-grazing allotments (prior to June 15) in the Hoback EHU.

E. Habitat Management

A primary goal of the *habitat* portion of the BFH program is to enhance transitional and winter elk habitat to potentially minimize the transmission and prevalence of brucellosis in elk associated with feedgrounds. Manipulating decadent vegetation can increase the production and palatability of grasses. If habitat improvements are completed near feedgrounds or between summer range and feedgrounds, the enhanced forage produced will decrease the dependence of elk on artificial feed, snow conditions permitting. Reduced feeding durations and lower elk concentrations on feedgrounds, especially during the high transmission risk period, may decrease the probability of intraspecific brucellosis transmission events. Habitat enhancement projects also create vegetative diversity, enhance aspen communities, and improve range conditions for a myriad of species.

Habitat enhancement projects can be employed to mimic natural disturbances and restore habitat to a more properly functioning condition. BFH biologists work with WGFD Habitat biologists, Wildlife biologists, and other agencies to implement habitat enhancement projects that improve elk transitional and winter ranges as well as habitat for many other wildlife species. These projects involve identification of treatment areas, habitat inventory, implementation, and post-treatment monitoring.

Numerous habitat improvement techniques can be utilized to increase habitat quantity and quality. These methods involve manipulating vegetation to create a mosaic of multi-aged plant communities across the landscape. The most commonly used habitat enhancement techniques include prescribed fire, mechanical treatments, and herbicide application.

Very limited amounts of native winter range are present in the Hoback EHU. Little opportunity exists for developing significant acreages of winter range today. However, potential for spring and fall range enhancement does exist. Only one habitat enhancement project has been proposed and implemented within the Hoback EHU on elk transitional range (Figure 16). Treatments that target improvements to spring ranges and reduce the number of elk fed and dependency on feed during the 3rd trimester of pregnancy should theoretically reduce the risk of brucellosis transmission.

BFH biologists and Habitat biologists conduct vegetation monitoring to evaluate success of treatments in meeting objectives, and gain knowledge useful in planning future projects. Permanent plots are established to collect attributes of habitat quality and monitor post-treatment vegetation responses. Ideally, data from a plot located in a treated area (e.g., prescribed fire) are compared with data from an untreated ("control") area to detect vegetative changes. If a control plot is not established, data collected from the treated site during different years provide temporally comparative information. Data collected from plots include one or several of the following: cover, shrub/tree density, shrub/tree age structure, forage production, species diversity, and photographs. In addition, elk use patterns in relation to treatments are monitored.

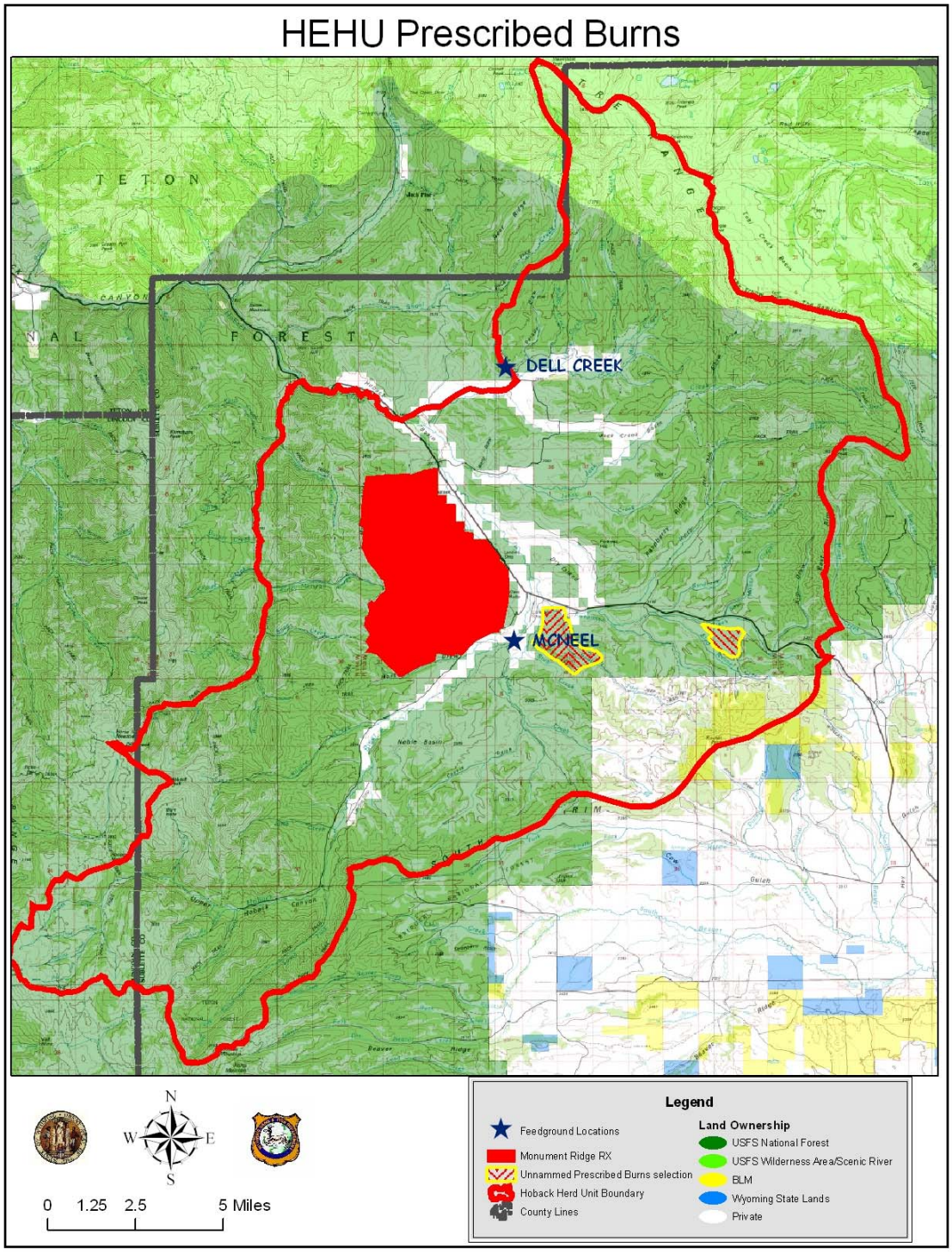

Figure 16. Prescribed fire project areas within the Hoback EHU.

Proposed/Completed Habitat Enhancement Projects

WGFD habitat and BFH biologists have collaborated with USFS-BTNF personnel on numerous planned projects. WGFD personnel will continue collaborations with USFS personnel in pursuing implementation of habitat enhancement projects in the future.

Monument Ridge Prescribed Burn

The Monument Ridge prescribed burn project comprises about 8,000 acres of mixed aspen-conifer and sagebrush vegetation types that are in late successional stages on BTNF land (Figure 16). WGFD has partnered with the BTNF on this project because of the benefits for elk winter, and parturition range in this area, as well as a wide variety of other species benefits. Late successional aspen has potential to be lost in this area if conifer densities are not decreased and the aspen treated with disturbance. The improved condition of aspen stands has the potential to provide long-term forage production for elk, moose, deer and other wildlife. Additionally, sagebrush communities are in late successional stage and burning this community type should provide better quality forage for a wide variety of species, including elk.

The planning of this project is complete. Habitat-type mapping for the project has been completed. The BTNF has divided this project into 6 burn units to be implemented individually. Cattle grazing operations have been temporarily modified to rest the particular pasture area one year pre-burn and two years post-burn to increase fine fuels for carrying fire and to allow for post-burn rest.

The first unit, approximately 800 acres, was burned in September and October of 2006. This first burn unit was primarily sagebrush with a few small clumps of mixed aspen-conifer. Fine fuels were not at their optimal level for fire spread, however, a good mosaic was accomplished in the sagebrush areas. Burn severity monitoring was conducted within weeks after implementation and post-burn monitoring will be completed in the summer of 2007.

F. Literature Cited

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